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Road Expansion in Urban Area

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Abstract: ***The study was focused on determining the road expansion and network spread of a particular selected area (Kalinga institute of social studies) in Bhubaneswar city of Odisha state for which the urban development or urban sprawl took place, here the data is observed in between 15years of gap. The development or creation of road caused different creation of economic zones and helped in socio-economic improvement of people and in GDP growth of that particular area. The software used for analysis is Arc GIS; different satellite data's are captured and mapped. The data's are generated from the spatial data. The dimensions of road network in year of 2005 are marked out and compared with the present scenario of that particular area and the difference is the development graph. Due to road how much of urbanization or growth occurred is also seen and their increase in area is also mapped out. From this entire study it is to be visualized that how a creation of road network causes in increase in growth and development of that particular area in terms what we say is urban sprawl.***
Keywords: Urban sprawl, Arc GIS, Road network growth, 2005 and 2020 satellite image.

I. INTRODUCTION

Road is a major need for development of an area. If the roads and the network of an area is connected and well distributed then the movement and the spread of urban development occur. In this study we are observing the road networks between 15years of gap and we are analyzing the effect of development of road and its dimensions with respect to creation of new market places and development of socio-economic standards of the area. The networks are selected in the kiss area of Bhubaneswar and observed through Arc GIS and satellite data's are observed analytically and shape files are created. The geometrical calculations are based over UTM projections and later the difference is observed between the years and visualized through KML. The data of 2005 year is seen as the base data and number of constructed roads are mapped and compared with the constructed and modified roads of 2020. And at end the comparison sheet is seen for better evaluation .As the development of roads occurred thus enhanced the urbanization or creation of new residential and commercial buildings.

II. METHODOLOGY

A. *Software Used*

1) *Google Earth Pro:* Google refers to Google Earth as a "geographic browser." Google Earth is a geo browser that accesses satellite and aerial imagery, ocean bathymetry, and other geographic data over the internet to represent the Earth as a three-dimensional globe.

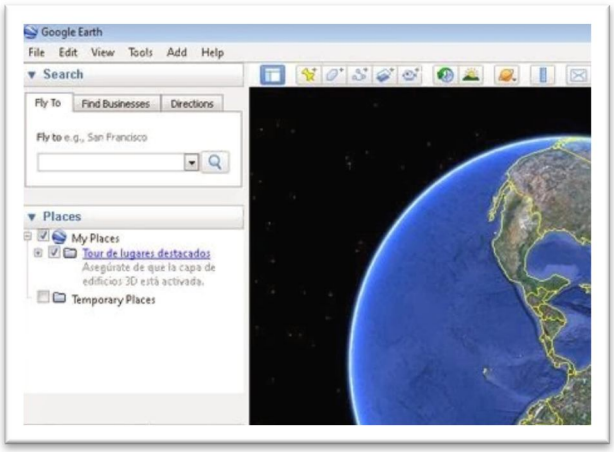


Figure 1: Google Earth places

2) *Google Map:* It is a web mapping service application and technology provided by Google. A related product is Google Earth, a stand-alone program for Microsoft Windows, Mac OS X, Linux, SymbianOS, and iPhoneOS which offers more globe-viewing features, including showing polarareas.



Figure 2: Google map

3) *Arc GIS 10.1:* It is a geographic information system (GIS) for working with maps and geographic information. It is used for creating and using maps, compiling geographic data, analyzing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database.

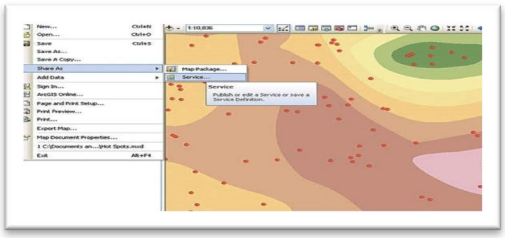


Figure 3: Arc GIS 10.1

4) *AutoCAD:* Right-of-ways and well site plans requiring approval be submitted in AutoCAD formats (DXF, DWG or DGN) to government agencies.

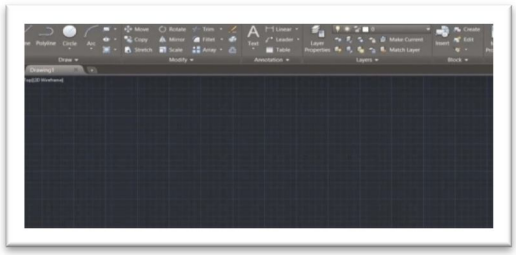


Fig 4: Row Image

5) *Civil 3D:* Using AutoCAD Civil 3D software for preliminary design is its ability to access and use data available through geographic information system (GIS). Before ground survey is available, you can retrieve surface data; political boundaries, roadways, and water feature information directly from GIS and reference it in to AutoCAD Civil 3D software.

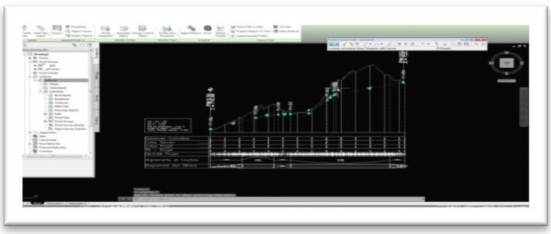


Fig 5: Cross section of road in 3D

III. ANALYSIS

A. *Analysis of 2005 Year Data*

The satellite data of kiss area of 2005 year is obtained and the findings are mapped. In this analysis the existing roads are mapped and geometrical dimensions are obtained through satellite based analytical data.

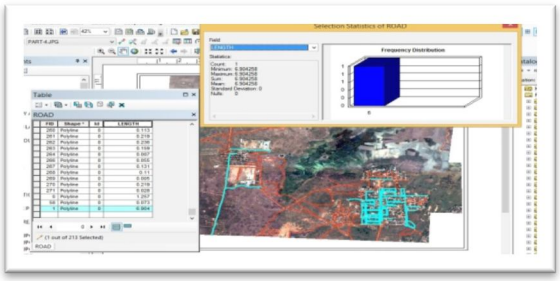


Figure 6: Existing road layout and dimensions are calculated

B. *Analysis of 2020 Year Data*

The updated 2020 year data of kiss area is here analyzed the roads are now visible better and the networks are modified to setup the road layout view.

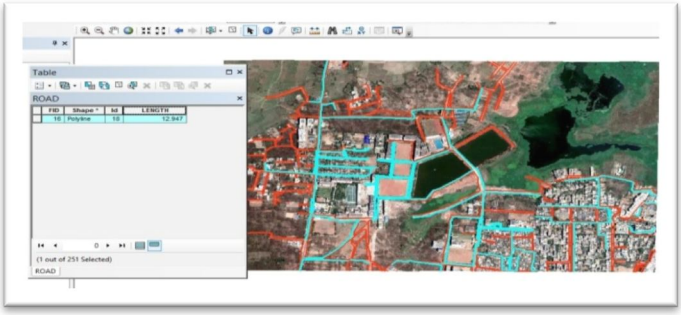


Figure 7: Existing road layout and dimensions are calculated

The road dimensions area geometrically calculated after the digitization process gets completed and the attributes are calculated and new road branches are also mapped.

IV. RESULTS AND DISCUSSION

Road statistics and dimension comparison

2005 YEAR CONSTRUCTED ROAD DIMENSIONS		
SL.NO	LENGTH IN KM	TYPE
1	1.257	FOOTPATH
2	6.904	BITUMEN
3	0.034	KACCHA ROAD
4	0.178	KACCHA ROAD
5	0.072	KACCHA ROAD
6	0.104	KACCHA ROAD
7	0.158	KACCHA ROAD
8	0.045	KACCHA ROAD
9	0.269	KACCHA ROAD
10	0.22	KACCHA ROAD
11	0.149	KACCHA ROAD

12	0.12	KACCHA ROAD
13	0.281	KACCHA ROAD
14	0.16	KACCHA ROAD
15	0.228	KACCHA ROAD
16	0.3	KACCHA ROAD
17	0.307	KACCHA ROAD
18	0.265	KACCHA ROAD
19	0.048	KACCHA ROAD
20	0.158	KACCHA ROAD
21	0.048	KACCHA ROAD
22	0.098	KACCHA ROAD
23	0.073	KACCHA ROAD
TOTAL ROAD	11.476	

Table 1: 2005 Year constructed road dimension

2020 YEAR CONSTRUCTED ROAD DIMENSIONS								
SL.NO	LENGTH IN KM	TYPE	SL.NO	LENGTH IN KM	TYPE	SL.NO	LENGTH IN KM	TYPE
1	1.842	KACCHA ROAD	17	2.116	PUCCA	33	0.004	BITUMEN
2	0.021	KACCHA ROAD	18	2.275	PUCCA	34	0.009	BITUMEN
3	0.043	KACCHA ROAD	19	2.153	PUCCA	35	0.033	BITUMEN
4	0.04	KACCHA ROAD	20	2.255	PUCCA	36	0.03	BITUMEN
5	12.947	BITUMEN	21	2.255	BITUMEN	37	0.008	BITUMEN
6	1.126	FOOTPATH	22	2.212	BITUMEN	38	0.038	BITUMEN
7	1.14	FOOTPATH	23	5.563	BITUMEN	39	0.02	BITUMEN
8	1.135	FOOTPATH	24	5.182	BITUMEN	40	0.44	BITUMEN
9	1.164	FOOTPATH	25	5.559	BITUMEN	41	0.004	BITUMEN
10	0.056	FOOTPATH	26	1.171	BITUMEN	42	0.348	BITUMEN
11	0.04	FOOTPATH	27	1.121	BITUMEN	43	0.328	BITUMEN
12	0.4	FOOTPATH	28	1.111	BITUMEN	44	0.021	BITUMEN
13	2.273	FOOTPATH	29	1.129	BITUMEN	45	0.058	BITUMEN
14	2.169	FOOTPATH	30	1.113	BITUMEN	46	0.047	BITUMEN
15	2.256	PUCCA	31	1.111	BITUMEN	TOTAL	28.887	
16	2.235	PUCCA	32	0.009	BITUMEN			

Table 2: 2020 Year constructed road dimension

The total road layout is 28.887 kms in the whole network from which the longest road is layed in bitumen segment with a dimension of length of 12.947.

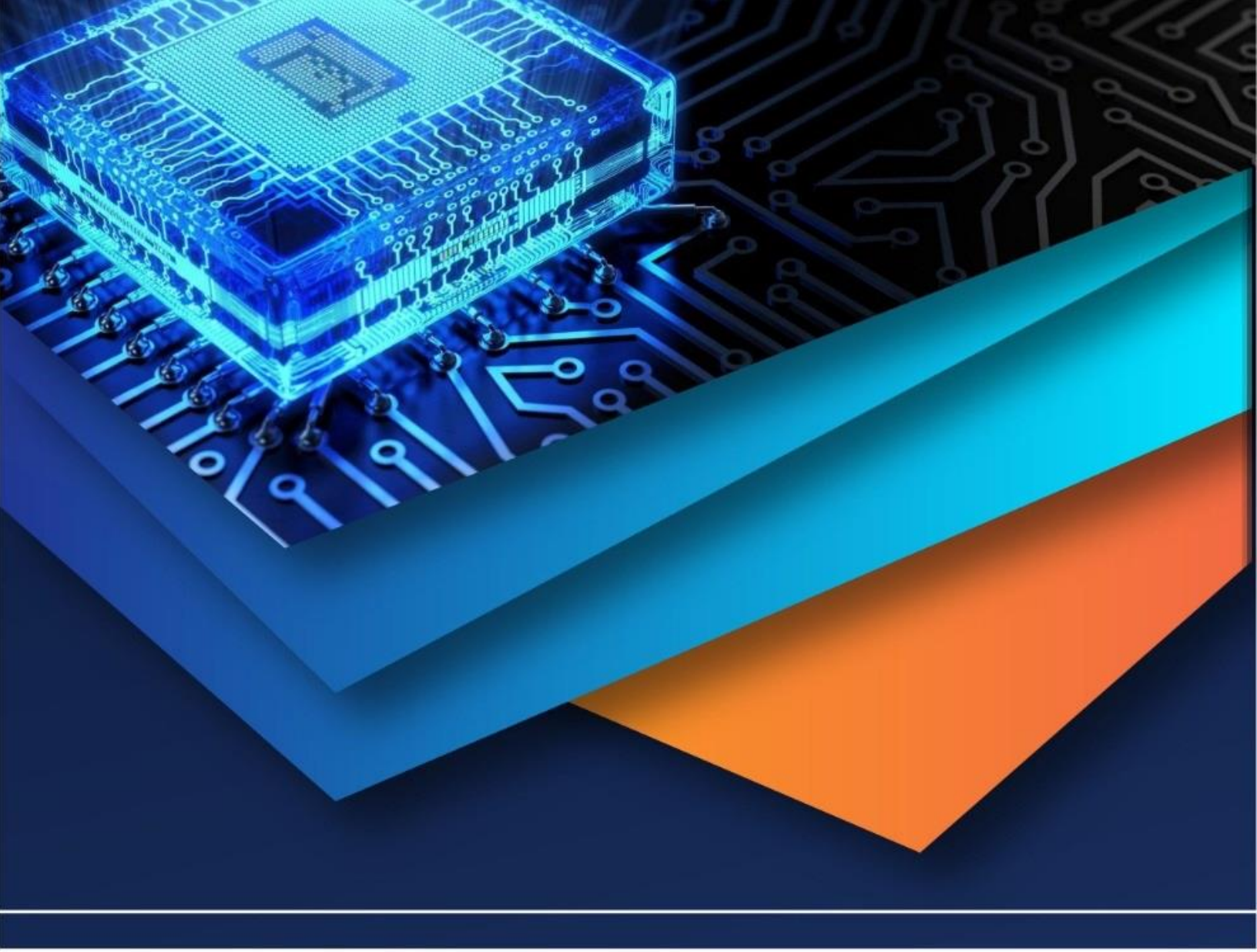
V. CONCLUSION

GIS System is designed to capture, manipulate, analyse, store and present the all type of Geographical data. Geographic information systems (GISs) have gained widespread attention and use in recent years. The technology can provide many benefits to the organizations, groups, and individuals who use it.

This is a technology to make more data more usable and put it to greater use for efficiencies, better performance and profits. Overally can increase the information available. GIS also proves to be an essential tools in Surveying, Transportation, Agriculture, Oil spill, Disaster Management, Mpping and Nevigation, Reservoir and Dam site location, Deforestation and Vegitation Management etc. Looking at this robust system, its application and uses are never-ending, just like its vast amount of geospatial data sets and databases. The count of this applications is never going to fall. Using GIS is not just limited applications, but it has around Thousand plus uses and applications in various fields.

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